

# PROGRAM BOOK



7<sup>th</sup> International Conference on  
Ship and Offshore Technology

“Enhancing The Sustainable Use of Ocean-based Resources  
Through Innovation on Maritime Technology”



POLITEKNIK  
PERKAPALAN  
NEGERI SURABAYA



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## **International Steering Committee (ISC)**

Chair	: Ir. Eko Julianto, MSc., FRINA	(Director of PPNS)
Co-chair	: Chris Boyd CEng, CMarEng, FIMarEST, FRINA	(RINA Chief Executive)
Members	:	
Prof. Richard Birmingham		(Newcastle University, UK)
Prof. Mehmet Atlar		(University of Strathclyde, UK)
Prof. Takeshi Shinoda		(Kyushu University, Japan)
Prof. Yanuar		(Universitas Indonesia)
Prof. I Ketut Aria Pria Utama		(Institut Teknologi Sepuluh Nopember, Indonesia)
Prof. Eko Budi Djatmiko		(Institut Teknologi Sepuluh Nopember, Indonesia)
Dr. Rafet Kurt		(University of Strathclyde, UK)
Dr. Hartono Yudo		(Diponegoro University, Indonesia)
Dr. Daeng Paroka		(University of Hasanuddin, Indonesia)
Dr. Wolter Hetharia		(University of Pattimura)

## **Local Organizing Committee (LOC)**

Chair	: I Putu Arta Wibawa, S.T., M.T., PhD
Co-chair	: Priyambodo Nur Ardi N., Ph.D
Secretary	: Dika Rahayu Widiana, Ph.D Dian Asa Utari, S.S., M.Pd.
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## **Welcome Message from RINA**

During 19 - 20 November 2021 the International Conference on Ship and Offshore Technology Indonesia (ICSOT Indonesia) was held on a hybrid format. ICSOT Indonesia is a biennial conference jointly organized by Indonesian universities and the Royal Institution of Naval Architects (RINA). The conference brings together practitioners, researchers, and academics from many countries to discuss and exchange their current research finding in maritime technology and other related fields. The theme of ISCOT Indonesia 2021 was “Enhancing the Sustainable Use of Ocean-Based Resources through Innovation on Maritime Technology”. A focus was made on Design & Production of Marine Structures, Ship and Offshore Hydrodynamics, Ocean Environment and Sustainability, Ocean Energy, Port & Harbour Engineering, Structural Mechanics, Occupational Health and Safety, among other others relevant topics.



The Royal Institution of Naval Architects is a proud co-organizer of ISCOT Indonesia, that on its seventh instalment brings the attention to such an important global subject. This conference was initiated at Institut Teknologi Sepuluh Nopember (ITS, Surabaya) in 2010 as part of the 50 years anniversary of ITS and higher education in naval architecture in Indonesia, and 150 years of RINA. Since then, it has been held at different universities throughout Indonesia. The second Conference was conducted in Pattimura University (Ambon) in 2012, the third Conference was held at Hasanuddin University (Makassar) in 2014, the fourth Conference was held back at ITS (Surabaya) in 2015 as special conference in commemoration to the 10 year anniversary of RINA Indonesia. The fifth Conference was held in Universitas Indonesia (Depok), and the sixth Conference was held at Diponegoro University (Semarang).

Surabaya, November 2021

**Chris Boyd CEng, CMarEng, FIMarEST, FRINA**

## Welcome Message from Director of PPNS

*Assalamualaikum Warahmatullahi Wabarakatuh*

*With all praise and gratitude to God*

*Welcome, Ladies and Gentlemen, Dear Colleagues*

I am pleased to welcome you to the 7th International Conference on Ship and Offshore Technology (ICSOT) 2021. As one of the largest archipelagic country in the world, two-thirds of Indonesia's territory is covered by water. The potential of marine resources is very large to be utilized for the welfare of the community. However, as outlined in 14<sup>th</sup> Goal of the Sustainable Developments Goals (SDGs), it is very important to ensure the use of marine resources does not have a

negative impact on the marine environment itself. Furthermore, it is obvious that the ocean covers three quarters of the Earth's surface and it has huge impact to drive global systems that keep our earth a safe place to live in, hence its use for various purposes must be carried out responsibly. This is where researchers, academics, and practitioners in the maritime sector play a big role to ensure the environmental pillar in sustainable development in maritime sector is considerably measured.

Politeknik Perkapalan Negeri Surabaya, as Vocational Higher Educations that totally focus on maritime sector, puts high priorities to enhance its role in enhancing any applied research, innovation and invention related to Maritime Sector and its supporting industries. Based on this mission, PPNS collaborates with the Royal Institution of Naval Architects (RINA), and supported by The UK Maritime Skill for Prosperity Project, conduct the Indonesian International Conference on Ship and Offshore Technology (ICSOT) Indonesia 2021. This conference is one of the contributions of PPNS and the RINA for dissemination of researches regarding problems, challenges and innovation on maritime technology to keep the sustainable use of ocean-based resources.

I do believe that through this international conference we can share our thought and ideas and research interests. And at the same time, we can initiate any possibilities to build strong collaboration in research, both nationally and internationally, so it can support the development of sustainable maritime sector in the world.

Surabaya, November 2021

**Ir. Eko Julianto, MSc., FRINA.**



## Welcome Message from Chairman of ICSOT 2021

It is our great pleasure to welcome you to the 7<sup>th</sup> International Conference on Ship and Offshore Technology (ICSOT) Indonesia 2021. This conference is an excellent platform that brings researchers from academia, industries, research institutions and classification bureau together to share and discuss current researches in the field of Maritime Technology, especially on how we can work hand in hand to enhance the sustainable use of ocean-based resources through innovation on maritime technology.



The calls for paper have attracted abstract submission from the United Kingdom, Japan, China, India, Malaysia, Russia and Indonesia. The accepted papers cover a variety of topics, including Design & Production of Marine Structures, Ship Hydrodynamics, Ocean Environment and Sustainability, Ocean Energy, Structural Mechanics, Occupational Health and Safety, and other relevant topics.

Organizing ICSOT Indonesia 2021 is a team effort. We are grateful to all the committee members who worked very hard to make this event happen successfully. We also would like to thank The Royal Institution of Naval Architects (RINA) Head Quarter London and the Indonesian branch for giving us the opportunity to be the host for ICSOT Indonesia 2021. In addition, we deliver our special thanks to United Kingdom Government and International Labour Organization for supporting this conference through the Skills for Prosperity Funding. Sincere gratitude is dedicated to the International Steering Committee (ISC) from 9 reputable universities in UK, Japan, and Indonesia, who help supervise the ICSOT Indonesia 2021. Moreover, we are thankful to all the authors who submitted their papers to this conference. Finally, I wish you a very productive conference with exciting and encouraging discussions and exchange of knowledge so that together we can anticipate a future of groundbreaking knowledge, research, and technology for Maritime Sector.

Surabaya, November 2021

**I Putu Arta Wibawa, S.T., M.T., PhD**

# ICSOT 2021 Guidelines

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## 1. Official Language

- The official language of ICSOT 2021 is English. All presentations including Q&A will be delivered in English.

## 2. Guideline for Participants

- Conference Venue The event of ICSOT 2021 will be held online by using Zoom as the virtual conference media.
- Registration Time: 13.45 – 14.05 (Local Time Jakarta, GMT + 7), Friday, November 19, 2021

## 3. Guideline for Keynote Speakers

- The 7<sup>th</sup> International Conference on Ship and Offshore Technology (ICSOT) 2021 will be held online by using zoom.
- Keynote speakers are required to submit presentation file in PPT (power point) format to [icsot@ppns.ac.id](mailto:icsot@ppns.ac.id), no later than 3 days before the conference.

## 4. Guideline for Presenters and Session Chair/Moderator

- The 7<sup>th</sup> International Conference on Ship and Offshore Technology (ICSOT) 2021 will be held online by using zoom.
- Presenters are required to submit presentation file in PPT (power point) format to <https://bit.ly/3D29eTW>, no later than 3 days before the conference.
- Presenters need to attend both Main Room session and Parallel session. Main Room session and Parallel session in virtual conference will be held using Zoom. Both Main Room session and Parallel Session, The ICSOT Committee will speak in English throughout the sessions which will also be recorded.
- During parallel session, the presenters and session chairs are asked to keep to the paper sequence as shown in the Program Book. By following the predefined schedule, participants can switch between sessions without missing the particular papers of interest.
- The presentation time for each presenter is 20 minutes including Q&A. The session chairs should allow the presenter for a 10 minutes presentation and leave 10 minutes for discussions. All presenters are requested to report their attendance to the session chair 10 minutes before the session begins.

## Virtual Conference Room for ICSOT 2021

**Topic** : ICSOT 2021

**Time** : November 19-20, 2021

**Join Zoom Meeting**

<https://zoom.us/j/98206375550?pwd=Tnd4VXBSVGprc1IwcVNFY0hxM1I5QT09>

**Meeting ID** : 982 0637 5550

**Passcode** : 2021

### Seminar Room

<p>Main Room</p> <p>Time :</p> <p>Track : Registration, opening ceremony, keynote speaker presentation and closing ceremony</p> <p>Link : Main Room</p>
<p>Room : I</p> <p>Time : 18:45 – 21:30 (day 1) / 10:00 – 15:00 (day 2)</p> <p>Track : Paralel Session</p> <p>Link : It will be shared before the parallel session I</p>
<p>Room : II</p> <p>Time : 18:45 – 21:30 (day 1) / 10:00 – 15:00 (day 2)</p> <p>Track : Paralel Session</p> <p>Link : It will be shared before the parallel session II</p>

# Technical Program

## Rundown of 7<sup>th</sup> International Conference on Ship and Offshore Technology (ICSOT) 2021

### DAY 1

Day/Date	Time (GMT + 7)	Program	Venue
Friday, 19 <sup>th</sup> November	13:45-14:05	Registration	Webinar (Main Room)
	14.05-14.10	PPNS Profile	
	14.10-14.15	Video Maritime Skill for Prosperity Programme in PPNS	
	14.15-14.20	ICSOT Teaser	
	14:20-15:20	Opening Ceremony	
		Welcome Speech from Chairperson of ICSOT	
		Welcome Speech from Director of PPNS	
		Welcome Speech from Deputy Head of Mission to Indonesia and Timor Leste, UK Embassy	
		Welcome Speech from Chief Technical Advisor, UK Skill for Prosperity Programme Indonesia	
	15:20-16:05	Keynote Speaker 1	
		Speaker: Mr. Chris Boyd (RINA Chief Executive) Title: Enviroment and Safety, RINA Vision Moderator: Dr. Desi Tri Cahyaningati, S.S., M.Pd	
	16:05-16:50	Keynote Speaker 2	
		Speaker: Prof Richard W. Birmingham (Newcastle University, UK) Title: The Place Of Both Modest And Mighty Technology In The Future Maritime World Moderator: Priyambodo Nur Ardi Nugroho, S.T., M.T., Ph.D.	
	16:50-17:35	Keynote Speaker 3	
		Speaker: Prof. Mehmet Atlar (University of Strathclyde, Glasgow, UK) Title: A Timely Retrofit Challenge For Greener Propulsion Of Ships Moderator: Yugowati Praharsi, S.Si., M.Sc., Ph.D.	
17.45-18.45	Break		

Day/Date	Time (GMT + 7)	Program	Venue
Friday, 19 <sup>th</sup> November	18.45-19.45	Workshop Green Shipping Moderator: Dr. Eng. I Putu Sindhu Asmara, ST., MT Title: Decarbonisation of existing ships through retrofitting and operation Speaker: Prof Osman Turan Title: Effect of biofouling on ship performance and energy efficiency Speaker: Dr Yigit Kemal Demirel Title: Circular economy in the maritime domain: path to sustainability Speaker: Dr Sefer Anil Gunbeyaz	Webinar (Main Room)
	19:45-20:45	Paralel Session Day 1	Room 1/Room 2
	20:45-21:00	Closing Day One	

Parallel Session I		
Venue	Room I	
Date	19 November 2021	
Moderator	Dr Yigit Demirel	
Paper ID	Time (GMT+7)	Paper Title and Authors
1570733607	19.45 - 20.05	A Numerical Study on Effect of Water Depth on Ship Hydrodynamic Derivatives <b>Jesswin George</b> Abhishek Raj Krishnankutty P
1570739694	20.05 - 20.25	Developing A Hybrid Value Engineering and Risk Assessment (VENRA) Framework for Shipbuilding and Ship Repair Industry Performance Measurement <b>Imam Baihaqi</b> Iraklis Lazakis Rafet Kurt
1570755109	20.25 - 20.45	The Design And Simulation Of The Linear Engine Generator Used For Electric Propulsion Of The Marine Transportation <b>Mingqiang Li</b> Dawei Wu Fangyu Zhang Ugochukwu Ngwaka Chen Gen

Parallel Session I		
Venue	Room 2	
Date	19 November 2021	
Moderator	Dr Anil Sefer Gunbeyaz	
Paper ID	Time (GMT+7)	Paper Title and Authors
1570746352	19.45 - 20.05	The Use Of Tidal Energy In Electricity Generation In The Context Of Decarbonisation <b>Yegor Petrov</b>
1570756296	20.05 - 20.25	Parametric Analysis Of An ORC For LNG Cryogenic Energy And Waste Thermal Energy Onboard A LNG Powered Marine Vessel <b>Salman Farrukh</b> Dawei Wu Raya Al-Dadah
1570758111	20.25 - 20.45	Safer onboard environments for Indonesian seafarers and fishers in the time of COVID-19 <b>Giles Thomas</b> L. Huang C. Ryan Soengeng Riyadi I Ketut Aria Pria Utama D Setyawan Wolter Hetharia

## DAY 2

Day/Date	Time (GMT + 7)	Program	Venue
Saturday, 20 <sup>th</sup> November	08:00-08:30	Registration and Preparation	Webinar (Main Room)
	08:30-09:15	Keynote Speaker 1	
		Speaker: Prof. I Ketut Pria Utama (ITS, Indonesia) Title: 20 Years Being A RINA Member: A Testimoni Moderator: Lusia Eni Puspadari, S.Pd.,M.Pd	
	09:15-10:00	Keynote Speaker 2	
		Dr. Ahmad Fitriadhy (University Malaysia Terengganu, Malaysia) Title: Application of Genetic Algorithm (GA) on Ship's hull-form Optimisation Moderator: I Putu Arta Wibawa, S.T., M.T., PhD	
	10.00-12.00	Paralel Session Day 2	Room 1/Room 2
	12.00-13.00	Break	
	13:00-15:00	Paralel Session Day 2	
	15:00-15:15	Break	
	15:15-16:15	Paralel Session Day 2	
	16.15-16.45	Closing Ceremony	Webinar (Main Room)

Parallel Session 2		
Venue	Room I	
Date	20 November 2021	
Moderator	Dr. Eng. I Putu Sindhu Asmara, ST., MT	
Paper ID	Time (GMT+7)	Paper Title and Authors
1570727883	10.00 - 10.20	Reconstructing the Ship Motions Using Combined Marine Simulator Simulation Toolbox and a Six-DoF Stewart Platform <b>Edwar Yazid</b> Midriem Mirdanies Rizqi Ardiansyah Rahmat Bubu Rina Ristiana Yaya Sulaeman
1570730783	10.20 - 10.40	Preliminary Design of Ducted Nozzle Propeller in Propulsion System of Catamaran Flat Plate Boat with Thrust Vectoring Variation <b>Evaldi Axsendra</b> Yeddid Yonatan Eka Darma I Gusti Ngurah Agung Prasetya Dharma Yudha
1570737477	10.40 - 11.00	The Development and Challenges of China's Shipbuilding Industry <b>Shinjun Ko</b> Takeshi Shinoda
1570739520	11.00 - 11.20	Evaluation for ballast tank drainage by two-phase flow model based on hydraulics experiment and simulations <b>Guangshuai Liu</b> Takeshi Shinoda Toraharu Watanabe Hideo Obata Takakazu Nakamori Kenji Kuroki

Paper ID	Time (GMT+7)	Paper Title and Authors
1570754866	11.20 - 11.40	Evaluation For Ballast Tank Drainage By Hydraulics Experiment <b>Toraharu Watanabe</b> Takeshi Shinoda Guangshuai Liu Hideo Obata Takakazu Nakamori Kenji Kuroki
1570741899	11.40 - 12.00	Some Remarks on Application of Dead Ship Criteria to Indonesian Ro-Ro Ferries <b>Daeng Paroka</b> Muhammad Akbar Asis Andi Haris Muhammad Sabaruddin Rahman
1570748610	13.00 - 13.20	Hull Vane's Investigation with NACA 4412 on variation angle of attack and position <b>Nurhayati Utami</b> Purwo Joko Suranto Wiwin Sulistyawati
1570753231	13.20 - 13.40	Numerical Simulation of Sloshing in the Prismatic Tank with Vertical Baffle Using Smoothed Particle Hydrodynamics <b>Haikal Atthariq</b> Andi Trimulyono Deddy Chrismianto

Parallel Session 2		
Venue	Room I	
Date	20 November 2021	
Moderator	Burniadi Moballa, ST., MSc., Ph.D	
Paper ID	Time (GMT+7)	Paper Title and Authors
1570753827	13.40 - 14.00	An Investigation into the Justification of the Service Speed of Ro-Ro Ferry with Block Coefficient 0.8 Based on the Resistance and Seakeeping Performance <b>Rizky Ariesta</b> M Hafiz Nurwahyu Aliffrananda Soegeng Riyadi I Ketut Aria Pria Utama
1570754518	14.00 - 14.20	Concept Design of Ferrocement Patrol Vessel Supporting Indonesian Coast Guard Patrol Operation in Natuna Sea <b>Pratondo Ario Seno Sudiro</b> Jupriyanto
1570755185	14.20 - 14.40	Comparative Study of Ship Resistance on Monohull and Catamaran Model of 15 GT Fishing Boat <b>Heni Siswanti</b> Muhammad Musta'in Ainun Farisa
1570754413	14.40 - 15.00	Supporting Structures for Ocean Thermal Energy Conversion (OTEC) System: A Systematic Literature Review <b>Muhamad Ari</b> Yoyok Setyo Hadiwidodo Mukhtasor
1570754555	15.15 - 15.35	Effect of Ramp Door Material on the Wire Rope Fatigue Life and Winch Power <b>I Putu Sindhu Asmara</b> Fais Hamzah Tri Karyono M. Thoriq Wahyudi Shinta Kumaratih

Paper ID	Time (GMT+7)	Paper Title and Authors
1570753795	15.35 - 15.55	<p>Benchmark Tests of FINETM/MARINE CFD Code for the calculation of Ship Resistance at High Froude Numbers</p> <p><b>I Ketut Suastika</b>            Adnan Fauzi            Ahmad Saputra            I Ketut Aria Pria Utama            Ahmad Firdhaus            Sutardi            Mochamad Hariadi</p>
1570755014	15.55 - 16.15	<p>Performance Evaluation on Local Culture-Based Passive Radar Reflector for Traditional Fishing Boat in Indonesia</p> <p><b>I Putu Arta Wibawa</b>            Mohammad Basuki Rahmat            Dian Asa Utari            Eko Julianto            Eko Setijadi            Richard W.</p>

Parallel Session 2		
Venue	Room 2	
Date	20 November 2021	
Moderator	Dr. Dewi Kurniasih, S.KM., MKes.	
Paper ID	Time (GMT+7)	Paper Title and Authors
1570739045	10.00 - 10.20	Probability Assessment of Crossing Situation in Sunda Strait <b>Fadilla Prastyasari</b> Takeshi Shinoda
1570747225	10.20 - 10.40	Big Data Analysis for Container Staying Time Problem of Container Storage Yard <b>Tiago Novaes Mathias</b> Takeshi Shinoda
1570754434	10.40 - 11.00	Flow Management Innovation to Shift toward Sustainable Society <b>Hirofumi Doi</b> Takeshi Shinoda
1570754564	11.00 - 11.20	Analisis Of Migration Process From OHSAS 18001:2007 Towards ISO 45001:2018 At Occupational Health And Safety (OHS) Service Company As Supporting The Maritime Companies Dika Rahayu Widiana <b>Silvy Kurnia Sari</b> Imah Luluk Kusmimah
1570754968	11.20 - 11.40	Fire Risk Assessment in Upstream Oil and Gas Company to Prevent Catastrophic Effects in Offshore Facilities <b>Asep Zulpikar</b> Dika Rahayu Widiana Yugowati Praharsi Anggara Trisna Nugraha Mey Rohma Dhani

Paper ID	Time (GMT+7)	Paper Title and Authors
1570755194	11.40 - 12.00	Experimental Study Of Sandwich Strength Of Carbon Fibre Material With A Mixture Of Kevlar Fibre And Pineapple Fibre Using The Vacuum Assessed Resin Infusion Method As A Material For Mine Hunter Hull <b>Cahya Kusuma</b>
1570755258	13.00 - 13.20	The Effect Of Additional Interceptors On Ship Resistance And Lift Force, Case Study Patrol Ship 40 Meter <b>Cahya Kusuma</b> Wawan Kusdiana Sutrisno Riko Fendiawan Agoes Santoso
1570755199	13.20 - 13.40	Causative Analysis for a Sunk Ferry Roro in Indonesia: Seakeeping, Wave height and Lashing Correlation <b>Wanginingastuti Mutmainnah</b> Sony Anggara Topan Firmanda M. Rizqi Hariadi Siti Komariyah Rosihan Syarif M. Arif Kurniawan

Parallel Session 2		
Venue	Room 2	
Date	20 November 2021	
Moderator	Priyambodo Nur Ardi Nugroho, S.T., M.T., Ph.D.	
Paper ID	Time (GMT+7)	Paper Title and Authors
1570755748	13.40 - 14.00	Estimation of Exhaust Gas Emissions of Longline Vessels 51-100 GT at Nizam Zachman Oceanic Fishing Port <b>Vita Kurniawati</b> Choirin Alvia Syahrin Yopi Novita
1570755292	14.00 - 14.20	Re-Design Solid Box and Air Bag Configurations on Unsinkable Small Passenger Boat <b>Wolter Hetharia</b> E R de Fretes J Tupan E J Legwurnitua
1570756210	14.20 - 14.40	Electrical Resistivity as Prediction of High Volume Fly Ash Concrete Performance in Marine Environment Febrian Dany Dwi Putra <b>Wiwik Dwi Pratiwi</b> Indri Santiasih Kiki Dwi Wulandari Kharis Abdullah Nurvita Arumsari
1570761521	14.40 - 15.00	Effect of Occupational, Non Occupational, and Sociodemographics Characteristics Factors to the Fatigue Risk of Ship Steel Smelting Production Workers <b>Am Maisarah Disrinama</b> Farizi Rachman S Y P Mahardika

Paper ID	Time (GMT+7)	Paper Title and Authors
1570761741	15.15 - 15.35	The Analysis of Electrical System Requirement of Java Coastal Fishing Vessels <b>Purwidi Asri</b> Anggara Trisna Nugraha Hendro Agus Widodo Isa Rachman Joessianto Eko Poetro Mohammad Basuki Rahmat Ivan Azwar Septiadi Habibi Ahmad Basyari Dewi Rizani Ruwahida
1570764384	15.35 - 15.55	Monitoring and Fault Detection of Ship Main Engine Cooling Water Based on Modbus Communication and Interface Anggara Trisna Nugraha <b>Mayda Zita Aliem Tiwana</b>
1570749183	15.55 - 16.15	Real Time Notification for Autopilot Ship Data Communication Based on LoRA and MQTT <b>Afif Zuhri Arfianto</b> Lilik Subiyanto Yusril Ihda Imamuddin

## Keynote Speakers

Chief Executive of the Royal Institution of Naval Architects (RINA), a leading maritime organisation founded in 1860 to advance the art and science of ship design. "RINA is a world renowned and highly respected professional institution and learned society whose members are involved at all levels in the design, construction, maintenance and operation of all marine vessels. Delivering network intelligence with an ability to communicate with industry, academia and other bodies, such as the International Maritime Organization."

Chris' own background offers some insight into the broad range of RINA's interests. He began his career in the Royal Navy before studying Naval Architecture and Ocean Engineering at the University of Glasgow. Since then, he has worked all over the world for the private and public sector, covering all types of boats, vessels, and offshore structures. Chris strives to share his vision from sustainability to leadership and for him, a key part of RINA's role is to promote the highest standards of naval architecture and engineering, professional competence, and integrity. RINA works closely with members to develop training and seed innovation, particularly in areas such as the environment and safety. It does so with an awareness of its own legacy and history.



Richard Birmingham is a Professor of Small Craft Design, in Newcastle University. He was involved in all aspects of small craft sector of marine industry, including building, operating, designing, and regulating small craft, before joining the School in 1994. His research interests include design methodologies applied in the marine environment, design of small craft, including working craft (such as tugs and fishing vessels), high speed craft and recreational craft, ecologically sustainable recreational craft, design for safety applied in the marine environment, design and production of traditional working craft in developing economies, sustainable operation of working craft in developing countries and stability of marine vehicles. He was the President of RINA (the Royal Institution of naval Architects) from 2018 until 2020.



Mehmet Atlar is a research professor at Strathclyde University. He holds a BSc and MSc degrees in Naval Architecture & Marine Engineering from the Technical University of Istanbul while his PhD degree is from Glasgow University in the field of dynamic motion responses of semi-submersibles. His main research and teaching interests lie in the field of experimental and computational naval hydrodynamics with a bias on ship applications. He is specifically interested in ship performance and propulsion as well as motion responses. His recent research interests comprise novel hull-form designs, propulsor design and performance including cavitation and underwater noise, performance prediction and analysis with a specific interest on control coatings for marine biofouling. He is also interested in the energy saving of ships and rotating type renewable energy devices with biomimetic applications.



I Ketut Aria Pria Utama is a professor in the field of ship hydrodynamics in Institut Teknologi Sepuluh Nopember Surabaya. He completed his Bachelor's Degree in 1991 at the Department of Naval Engineering, ITS, Master's Degree in Maritime Engineering Science (1996) and Doctoral Degree in Hydrodynamics (1999) at the Department of Ship Science – the University of Southampton UK. The peak of professional achievement was achieved in 2006 as a Fellow Member (FRINA) of the Royal Institution of Naval Architects – the largest global maritime professional association in the world and achieved professional engineer status (chartered engineer, C.Eng) from the UK Engineering Council; elected to be a council member of RINA HQ since 2006 and elected as one of the Vice Presidents of RINA Regional Asia in 2019; was selected as a member of the Indonesian Academy of Sciences (APII) in 2015. The latest achievement is as a National Expert GloFouling Project where Indonesia is one of 12 countries as Lead Partnering Countries (LPC) – marine environment rescue program from IMO/GEF/UNDP, and member APII S20 Working Group at the 2022 G20 session.



Ahmad Fitriadhy's academic background is Naval Architecture. He was awarded as Doctoral Engineering (Dr. Eng) from Marine Transportation System Laboratory, Faculty of Engineering, Hiroshima University-Japan. Currently, He is a senior lecturer (Associate Professor) at Program of Naval Architecture, Faculty of Ocean Engineering Technology and Informatics, Universiti Malaysia Terengganu. Over the past fourteen years in academic teaching and research, his scientific papers such as monograph, book chapters, conference papers and high-impact journal papers have been appropriately published. He has been fully a member of Professional Bodies and awarded as Insinyur (PEng), ASEAN Engineer Registered (ASEAN Engr.), Chartered Engineer (CEng) from Engineering Council-UK and Chartered Marine Engineering (CMarEng) from Institute of Marine Engineering, Science & Technology (MIMarEST)-UK.



# **Presenter Abstract**

***7<sup>th</sup> International Conference on Ship and Offshore  
Technology  
(ICSOT) 2021***

Paper ID : 1570733607

## A Numerical Study On The Effect Of Water Depth On Ship Hydrodynamic Derivatives

Jesswin George\*<sup>1</sup>, Abhishek Raj<sup>1</sup>, P. Krishnankutty<sup>1</sup>

<sup>1</sup>Indian Institute of Technology, Madras, India

\* Correspondence: oe20s015@smail.iitm.ac.in

*Abstract – Ships behave differently in shallow water when compared to deep water. Added resistance & sluggishness to manoeuvre are the common effects of shallow water conditions. This highlights the necessity of studying ship manoeuvring characteristics in shallow water. In the present study, variation of hydrodynamic derivatives with respect to water depth is studied. Horizontal planar motion mechanism (HPMM) under different shallow water conditions are numerically simulated using a Unsteady-Reynolds Averaged Navier-Stokes (URANS) based commercial solver. Several empirical formulas are available for predicting the shallow water derivatives, but most of them are for conventional ships. A new regression expression is proposed for estimating the hydrodynamic derivatives based on the simulated results.*

Paper ID : 1570739694

## Developing A Hybrid Value Engineering And Risk Assessment (Venra) Framework For Shipbuilding And Ship Repair Industry Performance Measurement

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**Abstract** – *This paper proposes a novel performance measurement framework to enhance the decision-making process in assessing the ship manufacturing (shipbuilding, ship repair, and ship conversion/modification) industry. Integrated Value Engineering and Risk Assessment (VENRA) approach performance measurement for ship manufacturing is developed to tackle the problem. Thorough literature and critical study of the existing performance measurement for ship manufacturing are reviewed to create novel VENRA performance measurements. The attributes collected from the literature are grouped into four criteria performance, named VENRA attributes, combining the technical, business, external and safety/risk performance groups. The initial model will be assessed through fuzzy DEMATEL TOPSIS to achieve the weighted score of each attribute. The framework will be applied to three shipyard case studies in Indonesia. The quantitative data (from shipyards) and qualitative data (from expert opinion/judgment) will be included to get the results and the framework's effectiveness.*

Paper ID : 1570755109

## The Design And Simulation Of The Linear Engine Generator Used For Electric Propulsion System Of The Marine Transportation And Offshore Gas/Oil Platforms

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*Abstract – Maritime shipping and offshore gas/oil platforms account for a large amount of greenhouse gas emissions. It is beneficial to use the linear engine generator (LEG) fuelled by low or zero-carbon fuel as the electric propulsion system for marine transportation and offshore gas/oil platforms to achieve net-zero carbon emission. The LEG could replace the diesel engine and gas turbine for marine applications, with its advantages of simple mechanical structure and adaptability to various fuels, such as hydrogen, ammonia, methane, biofuels, and various energy sources like nuclear and solar energy. This article introduces the ammonia/hydrogen-fuelled LEG prototype for electric propulsion for marine transportation. The LEG parametric sensitivity analyses are analysed for performance evaluation through simulation modelling. Furthermore, a detailed design of 1.8 kW electrical output LEG is presented.*

Paper ID : 1570753795

***Benchmark Tests of FINETM/MARINE CFD Code for the Calculation of Ship Resistance at High Froude Numbers***

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***Abstract*** – Benchmark tests of FINE<sup>TM</sup>/Marine CFD code were performed to verify the ship-resistance calculation results at high Froude numbers. The CFD code solves the Reynolds-averaged Navier-Stokes (RANS) equations with modelling of the free surface effects, that is, the generation of waves due to the ship movement on the water surface. A high-speed OSV boat was considered at three speeds (17, 20 and 26 knots), which correspond to the Froude numbers based on the volume of displacement,  $Fr_V = 1.29, 1.52, \text{ and } 1.98$ . The CFD results show a good agreement with the results of Savitsky's empirical formula and the numerical results obtained from Maxsurf Modeller. A good agreement was also found between the CFD results and available experimental data. The waves generated by the boat become higher and the Kelvin angle decreases with increasing speed, with patterns consistent with classical analytical predictions.

Paper ID : 1570754413

***Supporting Structures for Ocean Thermal Energy Conversion (OTEC) System: A Systematic Literature Review***

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***Abstract*** – Ocean thermal is one of ocean renewable energy sources, having great potentials, particularly in the equator region, in which the seawater temperature difference is about 20°C. Several studies have been carried out related to the conversion systems, environmental, economics, including optimum siting of the conversion systems. Among others, supporting structures for such the systems play a great role in contributing to the feasibility of the project. However, it seems there has been no common consensus or guideline to which supporting structures fit best to a particular case under consideration. Further works are required to fill this gap so that a better understanding on the supporting structures may be presented. The purpose of this work is to conduct a systematic literature review of the available studies that attempted to deal with Ocean Thermal Energy Conversion (OTEC) structures. The type of the structures, the type of loads, and the most frequent critical structural parts are reviewed and presented in this paper. Analytical recommendations will then be drawn in light with the need of guidelines in assessing supporting structures associated with cases possible.

Paper ID : 1570754555

***Effect of Ramp Door Material on the Wire Rope Fatigue Life and Winch Power***

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***Abstract*** – *The object of this research is the passenger deck ramp door of the 1500 GT ferry ro-ro ship. This research will compare the material of the installed ramp door that uses ASTM A36 steel and the alternative design that uses ST 52 steel. Both materials are carbon steel with a carbon content of 0.29% in ASTM A36 steel and 0.21% in ST 52 steel. The carbon content makes the yield strength value on ST 52 steel is higher than ASTM A36 steel. Accordingly, the alternative design has a thinner plate size than the existing ramp door. The weight of the installed ramp door is 9.34 tons, while the alternative structure weight is 8.21 tons. Based on the construction weight, the wire rope for the ramp door is 9 mm in diameter, with a 20% increase in the estimated lifetime from 10 years for the installed ramp door and 12 years for the alternative design. This ramp door will be using an electro-hydraulic winch with a power requirement of 33.91 kW for the installed ramp door and 28.76 kW for the new design, which means it increased by 15.2% in power efficiency.*

Paper ID : 1570755014

***Performance Evaluation on Local Culture-Based Passive Radar Reflector for Traditional Fishing Boat in Indonesia***

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**Abstract** – *The accident of a fishing vessel hit by a larger merchant ship has been quite common in Indonesia, especially in the fishing ground that intersects the busy shipping lane. The main causes for the accidents were the failure of large vessels on detecting the fishing boats clearly, especially at night or during foggy weather conditions. These situations were exacerbated by the lack of standard navigation lights on fishing vessels, and the absence of radar reflector on-board. The attempt to introduce passive radar reflector has been conducted to small fishing community in Muncar, East Java. The focus group discussion concluded that local fishermen showed their interest to equip their boat with radar reflector. However, since local fishermen always care about the aesthetic aspect of their boat as part of their local culture, moreover to ensure the acceptance of the radar reflector technology among the local fishing community, it is important to consider the design of the radar reflector in harmony with the ornamentation that the local fishing boats have. Based on the above issue, the passive radar reflector that adopts the ornamentation found on local traditional fishing vessels has been designed. The prototype is in the form of standard octahedral passive radar reflector that is placed in the "double catch rain" position, covered by casing in the form of Mosque dome made of fiberglass reinforced plastic. The use of mosque dome is based on ornamentation that is mostly found on the traditional fishing boat in East Java. Moreover, to minimise the decrease of Radar Cross-section (RCS) because of the boat rolling, the octahedral radar reflector is designed in such a way that the position of "double catch rain" can be maintained during the ship rolling. The prototypes will include 2 dimension of octahedral: 250mm x 250mm x 350mm, 200mm x 200mm x 280mm. This paper explores the design of local culture-based passive radar reflector. The result of performance test on RCS is evaluated, and the effect of ship rolling on the proposed design of local culture-based passive radar reflector is identified.*

Paper ID : 1570746352

***The Use Of Tidal Energy In Electricity Generation In The Context Of Decarbonisation***

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***Abstract*** – *The International Energy Agency's strategy is to reduce carbon dioxide emissions by 2050. Since the energy sector generates most of these emissions, it is this industry that should be affected by the maximum changes. One of the possible ways is the development of hydropower, this article will consider different types of tidal power plants, compare them and conclude that it is advisable to use them as a replacement for the main types of electricity generation. As materials in the study, data from the works of specialists and data from international organizations were taken. The analysis shows the feasibility of various types of tidal power plants to participate in the decarbonisation process and reach 'Net Zero' by 2050.*

Paper ID : 1570756296

***Dual Utilization Of Waste Thermal And Cryogenic Energy Onboard An LNG Fuelled Marine Vessel Using ORC Technology***

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***Abstract*** – In the last two decades, the application of LNG as the main fuel in marine vessels has increased manyfold. Besides the energy obtained from combustion, LNG has 830 kJ/kg of cold energy as well, which is normally wasted during regasification. One way to utilize this energy is with the use of an ORC for two-fold recovery from the LNG engine and the cryogenic energy. This paper investigates the utilization of LNG engine waste heat and cryogenic energy using a regenerative ORC combined with the DE of LNG. A parametric sensitivity analysis has been conducted, using different working fluids to maximize the first and second law efficiencies. The effect of the condensation and evaporation pressures on the system performance have been investigated. Different fire-retardants were mixed with the pure working fluids to measure the effect on system performance. It was found that fire retardants limit the performance of the system. However, their inclusion is a necessity, and further study is needed to investigate a wide range of potential fire-retardant compounds.

Paper ID : 1570758111

***Safer Onboard Environments For Indonesian Seafarers And Fishers In The Time Of COVID-19***

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***Abstract*** – *The seafaring and fishing industries in Indonesia have been severely affected by the COVID-19 pandemic. There is an urgent need to research the best technical solutions to ensure the safety of seafarers and fishers so that they can keep working safely at sea. It is highly unlikely that the Indonesian fleet will be able to rapidly return to the pre-COVID-19 situation within the next few years. Therefore, long-term solutions are required. This paper report on the outcomes from a Newton Fund project where guidance is provided for owners, operators and masters to reconfigure their vessels and operations to ensure a safe working environment to counter the potential spread of the virus, as well as maintaining the integral safety of the vessels. This research is a collaboration between UCL, ITS, University of Pattimura and Orela Shipyard. This is a huge problem to address, with over 2.2 million fishers, 600,000 fishing vessels, 320,000 seafarers and over 34,000 commercial ships operating in Indonesia. To demonstrate the solutions, a series of case studies has been conducted, including: crew boats, fishing vessels, ferries and cargo vessels.*

Paper ID : 1570756210

***Electrical Resistivity as Prediction of High Volume Fly Ash Concrete Performance in Marine Environment***

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***Abstract*** – Reinforced concrete for marine structures requires specific properties since it faces an aggressive environment. The interaction of concrete with seawater causes damage both physically and chemically. The primary damage to reinforced concrete in the marine environment is chloride-induced corrosion of reinforcement. Chloride ions diffuse into the concrete body until it reaches the reinforcement surface. If the chloride concentration reaches a critical value, then corrosion begins to attack. This paper studies the resistivity of high-volume fly ash (HVFA) concrete as measured by the four-probe (Wenner) method. Then, the diffusion coefficient of concrete is approximated from its resistivity. By taking a chloride threshold value, the age of reinforced concrete with a certain cover depth can be predicted. This study tested HVFA concrete with 50% FA substitution compared to normal concrete. Fly ash characterization was carried out using XRD, XRF and SEM techniques. The resistivity of HVFA concrete was found to have a higher value than normal concrete. This data indicates that HVFA concrete has better resistance to chloride-induced corrosion than normal concrete. In addition, HVFA has a longer service life than normal concrete in chloride environments such as seawater.

Paper ID : 1570761741

***The Analysis of Electrical System Requirement of Java Coastal Fishing Vessels***

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***Abstract*** – *The activities of fishermen in catching fish should be supported by adequate facilities and infrastructure. The electric fishing boats designed in this study are designed to be able to operate in the southern area of the island of Java. The stages in this research are looking for load data to calculate the electrical power requirements and other required electrical requirements. A comprehensive design, requires a literature study stage, the study and analysis is carried out through a Forum Group Discussion (FGD) with ship electrical experts. This study resulted in a draft of the fishing boat's electrical power requirements, which consisted of a load list, electrical equipment, technical calculations for ship operations in terms of the electrical power generated. A 5KW portable generator as the main generator is combined with a solar cell to support the ship's electricity. Cool storage is based on the capacity of fish and ice cubes in the box of 100 watts.*

Paper ID : 1570761521

***Effect of Occupational, Non Occupational, and Sociodemographics Characteristics Factors to the Fatigue Risk of Ship Steel Smelting Production Workers***

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***Abstract*** – Work fatigue is a process of decreasing efficiency, work performance, and reduced physical strength or endurance to continued the activities that must be done. This study was conducted to determine the effect of occupational factors (work climate, physical workload), non occupational factors (sleep quality, disease history, exercise habits, drinking water consumption), and sociodemographic characteristics (age, marital status, nutritional status, length of work) against work fatigue on Ship Steel Smelting Production Workers. Based on the results of research using the Industrial Fatigue Research Committee questionnaire, many as 36% of workers experienced moderate fatigue, and 22% of workers experienced severe fatigue. The research method used ordinal logistic regression, Mann Whitney, and Kruskall Wallis. The results of the partial test showed that sleep quality (p-value 0.021), age (p-value 0.009), and years of service (p-value 0.000) had an effect on work fatigue. The results of the different test indicated that there are no variables that have differences in work fatigue. The recommendations given are progressive muscle relaxation, education about important aspects of sleep quality, changing work positions, providing job rotation and training planning, conducting regular and periodic medical check up.

Paper ID : 1570764384

***Monitoring and Fault Detection of Ship Main Engine Cooling Water Based on Modbus Communication and Interface***

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***Abstract*** – Main engine failure can damage the engine system and reduce navigation safety, leading to severe maritime accidents. The cooling system is essential to avoid engine mechanical efficiency reduction and engine failure due to overheating. Thus, a monitoring and fault detection system is needed. The system made is based on RS485 Modbus Communication and Interface. The acquisition device uses existing components in the 7S-50MC Diesel Engine. PLC is used as a processing device and Logic Panel Autonics S070 as an interface. From the test, fault detection in this study can provide error indicators when abnormal conditions occur. In addition, data monitoring and system error indication can be displayed clearly on the Interface. Testing this system proves compliance with Biro Klasifikasi Indonesia (BKI) rules regarding the machinery alarm system. The developed research can be the basis for a more complex and reliable monitoring and fault detection system for application on ships.

Paper ID : 1570727883

***Reconstructing the Ship Motions Using Combined Marine Simulator Simulation Toolbox and a Six-DoF Stewart Platform***

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***Abstract*** – *Characterization of ship motions is greatly essential in evaluating performance of the ship and a ship mounted subsystems. This paper addresses such a challenge by proposing a methodology on reconstructing the ship motions using combined Marine Systems Simulator (MSS) toolbox and a six-DoF Stewart platform. Given the specifications of the ship, Stewart platform and Inertial Measurement Unit (IMU) system, ship motions are generated and then reconstructed by a six-DoF Stewart platform as a validation. The finding results show that the ship motions are able to be reconstructed and its randomness can be captured with considerable accuracy. However, as the sea state code increases, the accuracy of the proposed method decreases as indicated by the values of sum square error (SSE) of the reconstructed motions. The method can be recommended as ocean waves based ship motion simulator as well as other dynamics system motion simulators.*

Paper ID : 1570730783

***Preliminary Design of Ducted Nozzle Propeller in Propulsion System of Catamaran Flat Plate Boat with Thrust Vectoring Variation***

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***Abstract*** – The tourism sector is one of the economic supports in Banyuwangi regency. So with the Covid-19 pandemic, tourist visits decreased drastically. One of the tourist attractions had affected is Bangsring Beach, which has a unique and beautiful marine nature. Managers have difficulty finding operational funds. To help the problem, there needs to be an innovation that can attract visitors at Bangsring beach tourist attractions with a flat plate tourism boat equipped with Bottom Glass designed safely, comfortably, energy efficiently and sophisticated for underwater panoramic tourism facilities. All flat plate tourism boat systems must be changing and efficient, one of which is the propulsion system. Therefore, the ship propulsion has not designed yet, so it is take innovation in ship propulsion, namely with Ducted Nozzle Propeller added thrust vectoring. This can be a solution for the thrust to focus and be used entirely to move the ship. If the power can be focused and arranged as desired, then the propulsion system on the ship becomes effective and becomes efficient. The method used in this study used CFDs (Computational Fluid Dynamic). From the simulation results of 12 models ducting thrust vectoring nozzle that has been done and calculated in detail then get the highest thrust value (or thrust value) on the nozzle V 480 30o or nozzle that has a diameter of 480 mm with a thrust vectoring mouth opening of 30o with a thrust value of 14.45 kN. And the lowest thrust value on a V 490 10o nozzle or nozzle that has a diameter of 490 mm with a Thrust Vectoring mouth opening of 100 has a value of 6.46 kN. The average thrust increase of all Ducting Thrust Vectoring Nozzles is as large as 47%.

Paper ID : 1570737477

***The Development and Challenges of China's Shipbuilding Industry***

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***Abstract*** – *China's shipbuilding industry has undergone remarkable progress since 1979 when China adopted the reform and open-up policy. This paper attempts to examine China's shipbuilding industry, analyze its rise and the key factors behind, examine the challenges facing China's shipbuilding industry, and probe the outlook of the industry. The objective is to gain a clearer understanding of the fundamental problems of China's shipbuilding industry and the actions being taken by the industry to overcome the problems and fulfil its key role in supporting China's continuous development to become a great nation.*

Paper ID : 1570739520

***Evaluation For Ballast Tank Drainage By Two-Phase Flow Model Based On Hydraulics Experiment And Simulations***

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***Abstract*** – This study is utilizing hydraulics experimental and computational fluid dynamics (CFD) methods to verify the flow phenomenon in ballast water during the drainage process and to discuss the drainage efficiency. The model designed for the experiment is a part of ballast tanks of a typical bulk carrier and it is using the scale of 1:10 for the data collection. The experimental results are then validated and verified by conducting a two-phase flow model applied volume of fluid (VOF) simulation. The use of VOF in the ballast tank drainage is approved, so the drainage efficiency of the ballast tank can be predicted. This study also provides an optimization method for a simplified mathematical model, which can improve the agreement between the model and experimental results and create a more efficient yet simpler evaluation method for the configuration of the ballast tank drainage system.

Paper ID : 1570754866

***Evaluation for Ballast Tank Drainage By Hydraulics Experiment***

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***Abstract*** – *The quality of the ballast water drainage system during the cargo handling process of ships is an important issue for those involved in marine transportation such as cargo owners and shipping companies as it is significantly related to their revenue-shipping. An excess charge is incurred if moored beyond the scheduled time due to the loading time, and the deadweight tonnage superfluity residual water reduces the deadweight tonnage. To minimize the loss of their transportation, this paper addressed two problems: shortening the ballast drainage time and minimizing the amount of residual water in the ballast tank. The objective of this study was to construct an optimal ballast drainage system to solve these problems. In this paper, hydraulic experiments modeling the drainage of the ballast tank were conducted to evaluate the drainage system's design policy and reveal the optimum design condition of a ballast tank.*

Paper ID : 1570741899

***Some Remarks on Application of Dead Ship Criteria to Indonesian Ro-Ro Ferries***

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***Abstract*** – The International Maritime Organization (IMO) has developed the Second Generation Intact Stability Criteria (SGISC). Some hydrodynamics properties mainly corresponding to roll motion are necessary in the application on the SGISC. This paper discusses the hydrodynamics characteristics corresponds to dead ship criteria when the criteria is applied to Indonesian ro-ro ferries. This hydrodynamic characteristics is important because the Indonesian ro-ro ferries have different geometric characteristics with the ships used to developed the dead ship criteria. Model experiments consists of roll decay and roll test in beam seas were conducted using two different models. The damping factors for the vulnerability criteria level 1 were determined by using the formula to calculate roll angle due to wave in the weather criterion of IMO. To consider the effect of seaway characteristics, the capsizing index of the vulnerability criteria level 2 was calculated for different scatter wave data as well as different wave spectrum. The results show that the damping factors of Indonesian ro-ro ferries were smaller than those given in the weather criterion. The effective wave slope coefficient obtained by model experiment was not significantly different with that obtained by formula of weather criterion. A different capsizing index was obtained for different scatter wave data as well as different wave spectrum. Therefore it is suggested to determine the damping factors and the effective wave slope coefficient when the criteria is applied to an Indonesian ro-ro ferry. The scatter wave data and the appropriate wave spectrum for Indonesian seas should be determined in order to applied the SGICS not only for Indonesian ro-ro ferries but also for the others ships types.

Paper ID : 1570748610

***Hull Vane's Investigation with NACA 4412 on Variation Angle of Attack and Position***

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**Abstract** – Fuel efficiency is the goal of every ship, the accuracy of the motor selection, propulsion efficiency, as well as in the hull design for reducing drag. There have been many innovations in ship hull forms, such as the bulbous bow, transom steering, changing shape and becoming a multihull. This study adopted the NACA 4412 experimental as a hull vane that other researchers carried out and perform with CFD simulations, then compared them with experimental results. The suitability of the trend can be further developed by varying the angle of attack from NACA and changing its position to the hull. The angle of attack variations on 10, 20, 30, and positions change to the ship draft and AP-after perpendicular. Changes in the angle and position of NACA were investigated of their effect on the resistance component. From the analysis of the wave resistance, the most magnitude resistance decrease founded at the NACA position at a distance of 40 mm Trailing Edge of ship Draft and 85 mm Trailing Edge of AP. The lowest wave resistance was generating by the angle of attack of 30, with a significant decrease of 19% compared to 10. The more considerable lift drag was obtained after  $F_n$  0.3 from NACA at an angle of 30 and the smallest at 20. This investigative study was presented in graphs and data as well as conclusions and discussion of the results.

Paper ID : 1570753231

***Numerical Simulation of Sloshing in the Prismatic Tank with Vertical Baffle Using Smoothed Particle Hydrodynamics***

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***Abstract*** – The capacity of LNG carrier is increasing year by year as a consequence of the demand for liquified natural gas (LNG). One of the types of LNG carrier is membrane type that the tank is prismatic. A natural phenomenon in a liquid carrier such as LNG is sloshing. Sloshing is a violent phenomenon in fluid dynamics caused by excitation force. The present study will carry out sloshing with baffle shape to reduce free surface inside tank and impact pressure. In this study, there are single vertical baffle, and double vertical baffle used to reduce sloshing. In the present study, the meshless approach, so-called Smoothed particle hydrodynamics (SPH), is used to reproduce sloshing in the prismatic tank. The three-dimensional prismatic tank used to capture sloshing with the baffle. Regular roll motion with one pressure sensor uses in the present study to validate the SPH results. The result depicts vertical baffle effectively reduced fluid movement inside the tank and impacted pressure. The ratio of baffle and water depth is 0.9 showed the best height of baffle.

Paper ID : 1570753827

***An Investigation into the Justification of the Service Speed of Ro-Ro Ferry with Block Coefficient 0.8 Based on the Resistance and Seakeeping Performance***

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***Abstract*** – Determination of service speed has always become a major concern when designing a ship. However, a ship designer may not consider its effect on the use of energy and seakeeping performance of the vessel. The current paper discusses the determination of the actual and proper speed of a ro-ro ferry, operated between Tanjung Perak (Surabaya) and Lembar (Lombok), based on resistance estimation and seakeeping performance. The investigation is carried out using commercial software Maxsurf<sup>TM</sup> and further compared using the computational fluid dynamics (CFD) approach to capture the effect of detailed wave drag which is not quantified by the design software. The discussion and analysis include the optimum use of energy and hence the energy efficiency level, and the seakeeping performance of the ship covering the aspects of heave, pitch, and roll.

Paper ID : 1570754518

***Concept Design of Ferrocement Patrol Vessel Supporting Indonesian Coast Guard Patrol Operation in Natuna Sea***

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***Abstract*** – Natuna Sea is one of the most priority maritime operation region, because of its threats. Most of the threats are IUU Fishing and Sovereignty Violation. Indonesian Coast Guard (Bakamla RI) is the agency who has role to enforce maritime law on Indonesian Sea Territory, include Natuna Sea. But on the other side, Indonesian Coast Guard has main problem at its patrol fleet. It's caused by several reasons such lack of patrol ship, lack of operational budget, and lack of shipbuilding industry. Ferrocement is a sustainable shipbuilding material that has potency to solve the problems. It's easy to apply, strong enough, and cheap. The research aims to formulate the Concept Design of Ferrocement Patrol Vessel supporting Indonesian Coast Guard's patrol operation in Natuna Sea. The research methodology uses Design For Six Sigma (DFSS) which consist of Define the problems, Measure the potency, Analyze the solution, Design the concept, and Verify that the concept is solution of the problems. The research produces the Concept Design of Patrol Vessel based on user and environmental requirement with Ferrocement material. **Keywords**-Natuna Sea, Indonesian Coast Guard, Ferrocement, Design For Six Sigma methodology, Concept Design.

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**Comparative Study of Ship Resistance on Monohull and Catamaran Model of 15 GT Fishing Boat**

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**Abstract** – *One of the things that affect the value of the ship's resistance is the shape of the hull. On small boats a hull design that provides a smaller value of ship resistance is usually preferred. Therefore, in designing the ship, it is necessary to consider the selection of the shape of the hull that provides the optimal resistance value. So with a small main engine power, the ship can sail at the designed service speed. In this study, a comparison of the resistance value of fishing vessels ±15 GT with a length of 13 meters will be analyzed. The analysis will be carried out on 4 ship hull models, namely U-shaped monohull, V-shaped monohull, streamlined hull catamaran and asymmetrical hull catamaran. Assuming the same length (L), width (B) and draft (T), the differences in displacement, wetted surface area, frictional resistance and total resistance at a service speed of 16 knots were analyzed. Furthermore, a comparative analysis of the ship resistance of each model was carried out at several speed variations (50-150% Vs). Based on the analysis, it is known that the asymmetric catamaran hull model provides the smallest ship resistance value, but the reduction in the ship resistance value is also accompanied by a significant reduction in displacement compared to other ship models. While the U-shaped monohull model shows the opposite.*

Paper ID : 1570739045

***Probability Assessment of Crossing Situation in Sunda Strait***

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***Abstract*** – *The new routeing measures in Sunda Strait, that consist of traffic separation scheme (TSS), precautionary area (PA), and inshore traffic zones (ITZ), have been implemented since July 2020. The Automatic Identification System (AIS) data is utilized to understand the traffic pattern in this area. One dataset before and one dataset after the implementation of TSS are then converted into a vessel trip database. Eight vessel courses, two positions, and seven crossing zones are determined from the density plot to categorise the vessel trips. This study introduced a different perspective to assess the crossing situation by using three point-of-views to calculate the probability, namely crossing zone basis, course basis, and vessel type basis. The analysis result shows that the crossing situation are mostly occurred in the precautionary area of the new routeing measure.*

Paper ID : 1570747225

***Big Data Analysis for Container Staying Time Problem of Container Storage Yard***

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***Abstract*** – *The increasing demand for goods transportation inherent the risks of the terminal congestion, consequently decreasing the operational efficiency. Maritime transportation containerization has forced container terminals to carefully evaluate how to manage their yard operations. Nowadays, with the Internet of Things (IoT) and the development of data technologies the complexity of data within and around the terminal has been increased, and a lack of data-driven approaches in this matter can still be identified. Using data mining techniques, some effects that are producing inefficiency might be discovered and fixed. This paper presents a data-mining approach to extract useful information from the terminal daily operations report. Additionally, it is shown a comparison between the container's length of stay of a Straddle Carrier system and a Transfer Crane based.*

Paper ID : 1570754434

*Flow Management Innovation to Shift toward Sustainable Society*

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**Abstract** – Environmental issues have become increasingly important in the global society and need to be immediately addressed. Addressing these issues require lifestyle changes. This means that the current global society should be changed from a growing economics society to a sustainable developed society. In particular, the shipbuilding industry urgently needs to recognize a new paradigm for zero emissions technology to realize low energy consumption in the world's seaborne trade, specifically in ship production. This new paradigm will press the shipbuilding and maritime industries to change management policies and aspects based on the Sustainable Development Goals proposed by the United Nations. Different technologies are required to solve environmental issues, which need to be solved quickly. The lead time (LT) is defined as the time required from the beginning of the work to the delivery of the product. Shortening the LT is an efficient way of tackling environmental issues. One way of shortening the LT is to delay the beginning of new projects until the preceding project is completed. There are linkages and fluctuations in production systems, and they sometimes interrupt the progress of production. To address this issue, the theory of constraints (TOC) is applied to improve the overall optimization by focusing on the constraint conditions of production systems. In the present study, the value chain in the shipbuilding industry is improved by shortening the LT, which involves reducing the number of concurrent projects and restricting the amounts of materials used. Additionally, it involves making the present project a priority and not conducting unnecessary work in the current project. In this paper, a case study is shown in which we achieve 40% reduction in the LT of the ship design stage and reduce it to a comparatively short period of several months. In addition, the current shipbuilding management policies are reviewed, and the effects that impede innovation are clarified via the TOC thinking process, which is a support framework that clarifies the interaction between actions and results based on the causes and effects.

Paper ID : 1570754564

***Analisis Of Migration Process From OHSAS 18001:2007 Towards ISO 45001:2018 At Occupational Health And Safety (OHS) Service Company As Supporting The Maritime Companies***

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***Abstract – In 2018, the international Occupational Health and Safety (OHS) Management System standard had switched from OHSAS 18001:2007 to ISO 45001:2018. As one of the OHS service companies has been implementing the OHSAS standard, it was necessary to migrate to ISO 45001 to support its existence as a supporting industry for maritime companies. To carry out the migration process, a company needs a strategy so that the migration process can run effectively and efficiently. The methods used to decide migration strategies were the gap analysis and SWOT analysis method. Based on the result of the gap analysis, there were known that the company's readiness to migrate was 87.45%, and fourteen findings of improvement. The migration strategies had prepared using a SWOT analysis which results in seven migration steps. One of the steps was to improve the finding. Finally, the company could migrate and carried out the ISO 45001:2018 standard.***

Paper ID : 1570754968

***Fire Risk Assessment in Upstream Oil and Gas Company to Prevent Catastrophic Effects in Offshore Facilities***

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***Abstract*** – Operations in upstream oil and gas companies had a high risk of fire. It was an important thing that the company considers to reduce the hazards. The huge fire that occurred at the liquified petroleum gas (LPG) facility can cause the LPG production process to stop for approximately five months. In this case, the offshore facilities must de-pressurize and shut down the production wells to cut off the supply of hydrocarbons to the onshore facilities. If this treatment fails, it can cause catastrophic effects, such as rupture of subsea pipelines, oil spills, and even explosions. This study aims to identify and assess the fire risk in the hydrocarbon containment: crude oil and LPG storage tanks. The method used was Task Risk Assessment (TRA) which adjusted to the company's risk matrix. The results of the identification in crude oil storage tanks obtained 3 high-risk potential hazards were H2S Gas release, hydrocarbon liquid release from the bleeder vent, and crude oil spills. Four moderate-risks were high-pressure gasses, pipe corrosion, soil subsidence, and grass cutting machine with gasoline fuel. Then, 4 low-risk potential hazards were ineffective injection of corrosion inhibitors, incompetent people conducting pressure safety valve certification, emissions from diesel engines (vehicle entry), and entanglement in electrical cables and pipes. In LPG sphere storage tanks, there are 2 high-risk potential hazards were gas clouds from pipes, LPG spills/leaks. Three medium-risk potential hazards were grass cutting machine with gasoline fuel, use of portable generators (power for civil electrical equipment and tools), and soil subsidence. Then, 4 low-risk potential hazards were electrical equipment short circuit, incompetent people conducting control and safety valves maintenance, emissions from diesel engines (vehicle entry), and project equipment damaged. The recommendation based on this research is to carry out the control based on the hierarchy of control, namely: elimination, substitution, engineering control, administration, and use of personal protective equipment (PPE).

Paper ID : 1570755194

***Experimental Study Of Sandwich Strength Of Carbon Fibre Material With A Mixture Of Kevlar Fibre And Pineapple Fibre Using The Vacuum Assessed Resin Infusion Method As A Material For Mine Hunter Hull***

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***Abstract – The advantages of sandwich material compared to metal materials are its lighter weight and low magnetism, making it suitable for use as minehunting ship hull material. In this study, the authors will make a carbon fiber sandwich with a mixture of Kevlar fiber and pineapple sisal fiber compared to GRP (Glass Reinforced Polyester) and wood. This research uses the technique of making Vacuum Assessment Resin Infusion (VARI). Strength test with tensile test, impact test and hardness test using ASTM standard. Based on the test results, carbon composite with a mixture of pineapple fiber has a maximum stress of 70,8008 N/mm<sup>2</sup> which can be used as a hull material with a maximum length of 24m. While the carbon sandwich with kevlar has a maximum stress of 382,408N/mm<sup>2</sup>, GRP has a maximum stress of 127.24N/mm<sup>2</sup> and wood 66.78 N/mm<sup>2</sup>. Carbon fiber material with kevlar can be used for boats longer than 24m.***

Paper ID : 1570755258

***The Effect Of Additional Interceptors On Ship Resistance And Lift Force, Case Study Patrol Ship 40 Meter***

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***Abstract*** – Patrol Boats 40 meters Trim by Stern or ships tend to sink more at the stern. In this study, the addition of the Interceptor will be carried out, then the changes in resistance and ship lift will be analyzed due to the addition of the Interceptor. The modelling of the ship without an interceptor and with the addition of an interceptor is carried out using the Maxsurf software, then testing with the Fine Marine (Numeca) software with variations in interceptor height of 15,20,25 and 30mm and speed variations of 12,18 and 24 knots. From the test results, the highest value of the decrease in resistance is the 30mm interceptor. After the addition of the Interceptor at a speed of 12 knots the ship's resistance decreased by 16,196 kN or 42.9%, at a speed of 18 knots it decreased by 86.356 kN or 63.9% and at a speed of 24 knots, it decreased by 122,699 kN or 62.92%. The lift force generated at a speed of 12 knots 1,134,977 kN or the stern rises 0.2 cm, at a speed of 18 knots 1,135,598 kN or the stern rises 20.1 cm and at a speed of 24 knots, 1,132,403 kN or the stern rises 32.5 cm. From testing 4 Interceptor height variables, it was found that the interceptor was able to reduce the resistance value and increase the lift at the stern of the ship.

Paper ID : 1570755199

***Causative Analysis for a Sunk Ferry Ro-ro in Indonesia: Seakeeping, Wave height and Lashing Correlation***

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***Abstract*** – Ship safety operation is common topic that is widely discuss in over the world, include in Indonesia especially for Ferry Ro-ro. Several research and developments to increase the safety have been carried out from several stakeholders, such as issuance of regulation and safety procedures from government, operators, institutions, and others. However, several accidents are still happen. In 2018-2019, there were 763 maritime accidents happen in Indonesia. 30% of the accidents were passenger ship and almost 50% of accidents are sunk/capsized. The number of fatality caused by passenger ship accident was up to 30%. Therefore, it is important to conduct more research about safety operation of Ferry Ro-ro, especially for sunk or capsized cases in Indonesia. In this research, one sunk case is reanalysed based on official investigation report from Indonesian National Transportation Safety Committee. At first, causative factors contributing to the accident are identified utilizing MOP Model. Second, the technical analysis are carried out to support the previous qualitative analysis by MOP Model, such as Seakeeping and minimum angel analysis for vehicle being slide on car deck. The analysis result shows that the minimum angel causing the vehicle being slide on car deck is 20 degrees without being lashed. That angel number is reached when the ship was hit by wave height of 3 m, which was the wave height at the time of the accident. The qualitative and quantitative results are correlated. This research is aimed at getting a lesson learned and become a precaution for stakeholders to consider a more safety operation for Ferry Ro-ro.

Paper ID : 1570755748

***Estimation of Exhaust Gas Emissions of Longline Vessels 51-100 GT at Nizam Zachman Oceanic Fishing Port***

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**Abstract** – *The increase of exhaust emissions from longline vessels has long-term impacts. Accordingly, management measures are necessary and therefore, information about the current status of exhaust emissions from longline vessels is required. This research was intended to estimate exhaust emissions of longline vessels based on fuel consumption. The result was presented in Fuel Use Intensity (FUI) per fish production calculated in Kg and 1,000 Rupiah income. This research was conducted at Nizam Zachman Oceanic Fishing Port focusing on longline vessels between 51-100 GT. Results shows that the average fuel consumption is 135 tons per vessel. This value has exceeded the subsidy quota which is limited to 21.5 tons per vessel. Furthermore, due to inaccuracy issues found in statistical reports, the FUI of longline vessels is remarkably higher when compared to the world FUI for the similar group. Accordingly, this research concludes that the operation of longline vessels was fuel inefficient.*

Paper ID : 1570755292

***Re-Design Solid Box and Air Bag Configurations on Unsinkable Small Passenger Boat***

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**Abstract** – Previous works were conducted by the authors concerning the performance of unsinkable small passenger boat. The boat was designed and constructed in model scale and full-scale ship. The model was tested in tank and full-scale ship was tested at open sea to verify the design parameters. The research is continued in order to improve the boat performance. A re-design process was executed in order to modify the boat, air bags and centralised air supply system. The modified unsinkable boat was tested with the full passengers at sea for floating and sinking purposes. The required volume of solid boxes and air bags on board and outside are 1.12 m<sup>3</sup>, 0.563 m<sup>3</sup> and 0.213 m<sup>3</sup> respectively. The result of test at sea showed that the modified boat was floating, unsinkable at static condition even with full water in board and keep running with flooding conditions. It is found that the boat is stable due to its positive value of GMT and GZ. The recommendation was made for future application for the stakeholders

Paper ID : 1570749183

### ***Real Time Notification for Autopilot Ship Data Communication Based on LoRa and MQTT***

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**Abstract** – *The development of autopilot prototypes is used for testing new control algorithms and the reliability of other electronic components such as sensors and microprocessors. A control system is needed to control the boat to its destination. The relatively accurate system dynamics model affects the steering performance of the autopilot system. The system in question can be considered a boat with an actuator rudder, which experiences external disturbances. this system is broadly divided into two parts: the control station part and the autopilot unmanned ship part. These two parts communicate with each other using LoRa device. The data sent from the control station to the autopilot unmanned ship is target latitude and longitude coordinates. The autopilot unmanned ship will send feedback in the form of boat latitude and longitude coordinates so that users can find out the current location of the boat. Autopilot unmanned ship also provides feedback to the control station via LoRa in the form of boat coordinates so that users can find out the current location of the boat and whether the boat has reached the specified coordinates. The control station will send feedback from the boat to a database that can be monitored via the website to find out the boat's current condition on the website. The multi interface communication module was designed, implemented and evaluated, which was to transfer low-power, long-range large amount of data using MQTT and LoRa. The MQTT was able to communicate high transmission rate and long range while Lora was able to communicate low-power and long-range. Based on the testing results of the LoRa communication range with an open condition using an 8 cm vertical antenna or 3 dB antenna above. In this test the distance difference only affects the Receive Signal Strength Indicator or (RSSI)'s value. This RSSI is an indicator of the signal strength received by a wireless device. The farther the distance, the smaller the RSSI value, or the more negative the value, indicating a bad signal. Whereas, the closer the distance, the RSSI value will be greater or more positive, which means a good signal. The test is carried out starting in an open ricefield area. Table 3.1 shows that at a distance of 10 meters, the RSSI value is 60. Meanwhile, at a distance of 450 meters, the RSSI value is -96. So to receive data, LoRa is only capable of reaching 450 meters. More than 450 meters, LoRa has difficulty communicating and can no longer connect*